ASSIGNMENT 3

Textbook assignment: Chapter 3, "Direct Current," pages 3-1 through 3-126.
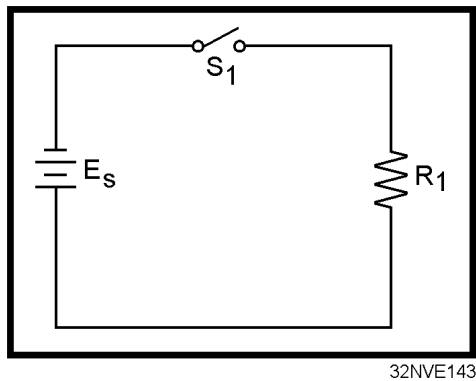
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Figure 3A.—Basic circuit.

IN ANSWERING QUESTIONS 3-1
THROUGH 3-3, REFER TO FIGURE 3A.

3-1. What parts of the circuit represent the
      (a) source and (b) load?

      1. (a) E_s (b) S_1
      2. (a) E_s (b) R_1
      3. (a) S_1 (b) R_1
      4. (a) S_1 (b) E_s

3-2. Which of the following terms describes
      the circuit condition?

      1. Partially shorted
      2. Partially open
      3. Shorted
      4. Open

3-3. Which of the following terms describes
      the figure 3A?

      1. Parts layout
      2. Exploded view
      3. Wiring diagram
      4. Schematic diagram

3-4. If circuit voltage is held constant, circuit
      current will react in what manner as the
      resistance (a) increases, and (b) decreases?

      1. (a) Increase   (b) decrease
      2. (a) Increase   (b) increase
      3. (a) Decrease   (b) decrease
      4. (a) Decrease   (b) increase

3-5. If circuit resistance is held constant,
      circuit current will react in what manner
      as the voltage (a) increases, and
      (b) decreases?

      1. (a) Increase   (b) decrease
      2. (a) Increase   (b) increase
      3. (a) Decrease   (b) decrease
      4. (a) Decrease   (b) increase

3-6. According to Ohm's law, what formula
      should be used to calculate circuit voltage
      if resistance and current value are known?

      1. $E = \dfrac{R}{I}$

      2. $E = \dfrac{I}{R}$

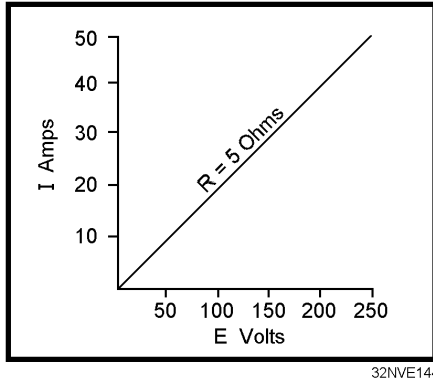   3. $E = IR$

      4. $E = \dfrac{I}{IR}$

Figure 3B.—Graph of current and voltage.

IN ANSWERING QUESTIONS 3-7 AND 3-8, REFER TO FIGURE 3B.

3-7. If the current is 15 amperes, what is the value of the voltage?

1.　50 V
2.　75 V
3.　100 V
4.　150 V

3-8. If the voltage is 200 volts, what is the value of the current?

1.　10 A
2.　20 A
3.　30 A
4.　40 A

3-9. Which of the following terms applies to the rate at which an electrical force causes motion?

1.　Power
2.　Energy
3.　Inertia
4.　Each of the above

3-10. Which of the following circuit quantities can be varied ONLY by varying one of the other circuit quantities?

1.　Voltage
2.　Current
3.　Resistance
4.　Each of the above

3-11. Which of the following is a correct formula for determining power in an electrical circuit?

1.　$P = EI$

2.　$P = I^2 R$

3.　$P = \dfrac{E^2}{R}$

4.　Each of the above

3-12. What is the current in a circuit with 15 ohms of resistance that uses 135 watts of power?

1.　10 A
2.　15 A
3.　3 A
4.　9 A

3-13. What is the total power used by a 15-ohm resistor with 4 amps of current?

1.　60 W
2.　240 W
3.　360 W
4.　900 W

3-14. What type of resistor should be used in question 3-13?

1.　Carbon
2.　Wirewound
3.　Precision
4.　Composition

3-15. How much total energy is converted by a l-horsepower motor in 10 hours?

1. 7.46 kWh
2. 8.32 kWh
3. 8.59 kWh
4. 9.32 kWh

3-16. If the energy used by the motor in question 3-15 is 9.5 kWh, what is the efficiency of the motor?
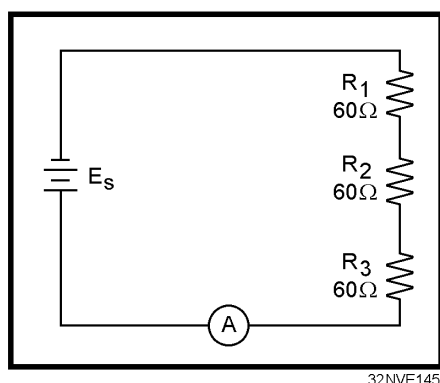
1. .981
2. .904
3. .876
4. .785

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Figure 3C.—Series circuit.

IN ANSWERING QUESTIONS 3-17 THROUGH 3-23, REFER TO FIGURE 3C.

3-17. What is the total circuit resistance (R)?

1. 20Ω
2. 60Ω
3. 180Ω
4. 240Ω

3-18. If the circuit current is 3 amps, what is the source voltage (E_s)?

1. 60 V
2. 180 V
3. 540 V
4. 720 V

3-19. What is the total voltage dropped by each resistor in question 3-18?

1. 20 V
2. 60 V
3. 180 V
4. 540 V

3-20. If the current decreases to 2 amps, what is the total voltage drop across each resistor?

1. 120 V
2. 230 V
3. 310 V
4. 400 V

3-21. What would have to be done to the circuit to cause the current to decrease to 2 amps?

1. The source voltage would have to be increased
2. The source voltage would have to be decreased
3. The resistance of R_1 would have to be decreased
4. One of the resistors would have to be removed from the circuit

3-22. If the circuit current is 2 amps, what is the total power used by each resistor?

1. 240 W
2. 460 W
3. 620 W
4. 800 W

3-23. What is the total power used in the circuit if E_s = 360 V?

1. 720 W
2. 1380 W
3. 1860 W
4. 2400 W

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3-24. When Kirchoff's voltage law is used to assign polarities to the voltage drop across a resistor, which of the following references is used to indicate the end of the resistor that the current enters?

1. Ground
2. Neutral
3. Negative
4. Positive
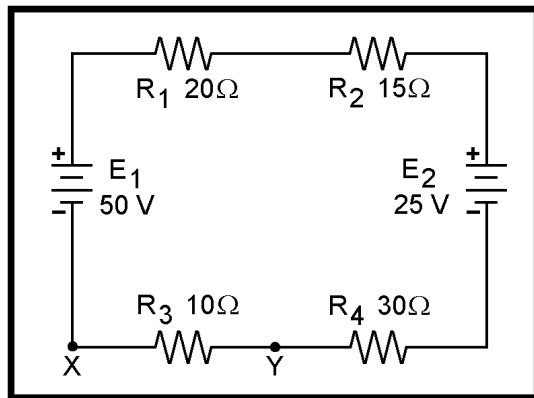
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Figure 3D.—Multiple source circuit.

IN ANSWERING QUESTIONS 3-25 AND 3-26, REFER TO FIGURE 3D.

3-25. What is the effective source voltage?

1. 15 V
2. 25 V
3. 50 V
4. 75 V

3-26. What is the total amount and direction of current through R_3?

1. 1.0 A from Y to X
2. 1.0 A from X to Y
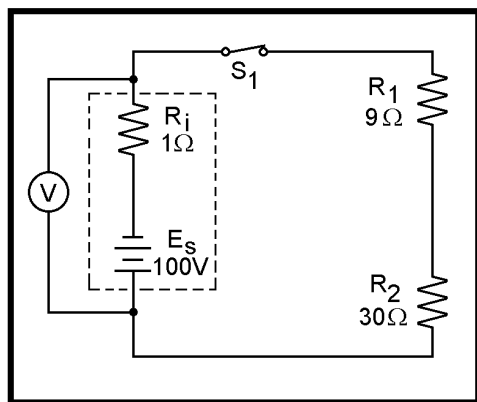3. .33 A from Y to X
4. .33 A from X to Y

3-27. Which of the following terms applies to a circuit in which there is NO complete path for current?

1. Open
2. Short
3. Closed
4. Grounded

3-28. A circuit in which the resistance is almost zero ohms is referred to by which of the following terms?

1. Open
2. Short
3. Closed
4. Broken

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Figure 3E.—Series circuit and source resistance.

IN ANSWERING QUESTIONS 3-29
THROUGH 3-32, REFER TO FIGURE 3E.

3-29. If R_2 has a short circuit, what will most
likely happen to the circuit?

1. R_1 will be destroyed
2. E_s will increase
3. V will indicate O volts
4. S_1 will automatically open

3-30. What is the total voltage drop across R_i
when the switch is closed?

1. 2.5 V
2. 6.5 V
3. 97.5 V
4. 100.0 V

3-31. What will the meter indicate with (a) S_1
open, and (b) S_1 closed?

1. (a) 100 V   (b) 100 V
2. (a) 97.5 V   (b) 100 V
3. (a) 100 V   (b) 97.5 V
4. (a) 97.5 V   (b) 97.5 V

3-32. To achieve maximum power transfer in
the circuit, which of the following
conditions must be met?

1. $R_i = R_L$
2. $I_s = I_L$
3. $E_s = E_L$
4. $K_s = K_L$

3-33. Maximum power is transferred from a
source to a load when the value of the
load resistance is of what value when
compared to the source resistance?

1. Equal
2. Twice
3. One-half
4. Several times

3-34. When maximum power is transferred from
a source to a load, what is the efficiency
of power transfer?

1. 5%
2. 25%
3. 50%
4. 95%

3-35. A circuit consists of three resistors
connected in parallel. $R_1 = 30$ ohms,
$R_2 = 15$ ohms, and $R_3 = 10$ ohms. If the
current through $R_2 = 4$ amperes, what is
the total source voltage?

1. 20 V
2. 60 V
3. 120 V
4. 220 V

3-36. What is the relationship of total current to
the current through a component in (a) a
series circuit, and (b) a parallel circuit?

1. (a) Divides   (b) divides
2. (a) Divides   (b) equals
3. (a) Equals   (b) equals
4. (a) Equals   (b) divides

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3-37. If a current has a negative polarity when Kirchoff's current law is applied, which of the following, statements is true of the current?

1. It is from a battery
2. It is from a generator
3. It is entering a junction
4. It is leaving a junction

3-38. Three equal resistors are connected in parallel and each resistor has an ohmic value of 300 ohms. What is the equivalent resistance of the circuit?

1. 100Ω
2. 150Ω
3. 600Ω
4. 900Ω

3-39. Three resistors with ohmic values of 120 ohms, 60 ohms, and 40 ohms are connected in parallel. What is the equivalent resistance of the circuit?

1. 10Ω
2. 20Ω
3. 30Ω
4. 40Ω

3-40. Two resistors with ohmic values of 90 ohms and 45 ohms are connected in parallel. What is the equivalent resistance of the circuit?

1. 10Ω
2. 20Ω
3. 30Ω
4. 40Ω

3-41. Which of the following terms describes a single resistor that represents a complex circuit?

1. Equal resistor
2. Phantom resistor
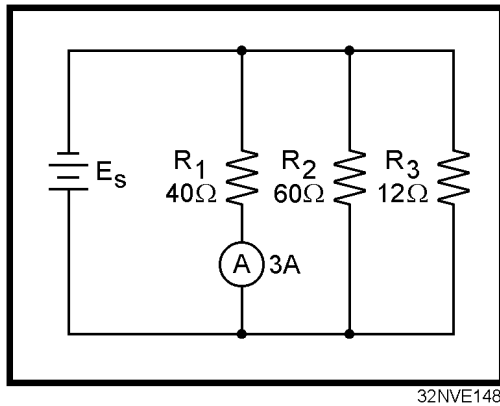3. Schematic resistor
4. Equivalent resistor

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Figure 3F.—Parallel circuit.

IN ANSWERING QUESTIONS 3-42
THROUGH 3-46, REFER TO FIGURE 3F.

3-42. What is the value of E_s?

　　1.　336 V
　　2.　300 V
　　3.　240 V
　　4.　120 V

3-43. What is the value of current through R_2?

　　1.　1 A
　　2.　2 A
　　3.　3 A
　　4.　4 A

3-44. What is the approximate value of total
　　　 resistance?

　　1.　　8Ω
　　2.　 37Ω
　　3.　112Ω
　　4.　257Ω

3-45. What is the value of total power?

　　1.　1.2 kW
　　2.　1.5 kW
　　3.　1.8 kW
　　4.　2.0 kW

3-46. What is the total power consumed by R_3?
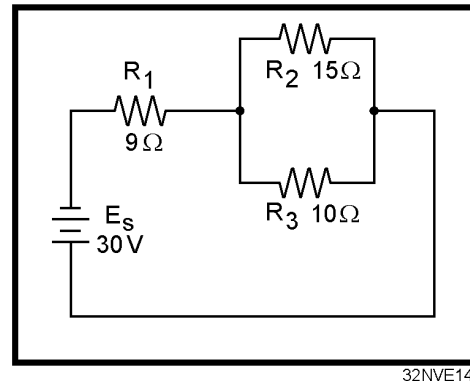
　　1.　108 W
　　2.　240 W
　　3.　360 W
　　4.　1200 W

Figure 3G.—Series-parallel circuit.

IN ANSWERING QUESTIONS 3-47
THROUGH 3-49, REFER TO FIGURE 3G.

3-47. What is the value of the total resistance?

　　1.　　3.6Ω
　　2.　 15Ω
　　3.　 34Ω
　　4.　 40Ω

3-48. What is the total power used in the circuit?

　　1.　 22.5 W
　　2.　 26.5 W
　　3.　 60.0 W
　　4.　250.0 W

3-49. What is the total voltage drop across R_3?

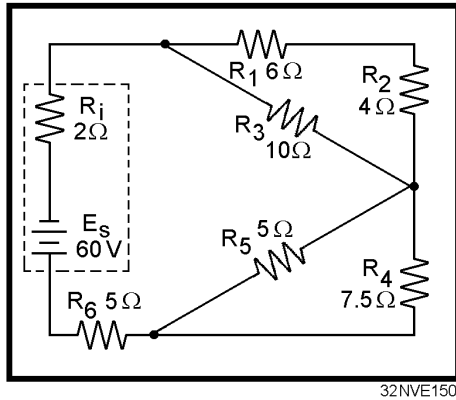　　1.　 8 V
　　2.　12 V
　　3.　18 V
　　4.　30 V

Figure 3H.—Complex circuit.

IN ANSWERING QUESTIONS 3-50 AND 3-51, REFER TO FIGURE 3H.

3-50. What is the value of total resistance?

1. 5Ω
2. 8Ω
3. 13Ω
4. 15Ω

3-51. If an equivalent resistor is used to represent the network of R_1, R_2, R_3, R_4, R_5, and R_6, what is the total voltage drop across this resistor?

1. 8V
2. 26V
3. 52V
4. 60V

3-52. If an open occurs in a series portion of a circuit, what is the effect on (a) total resistance, and (b) total current?

1. (a) Decreases to zero
    (b) Becomes infinite
2. (a) Decreases to zero
    (b) Decreases to zero
3. (a) Becomes infinite
    (b) Becomes infinite
4. (a) Becomes infinite
    (b) Decreases to zero

3-53. If an open occurs in a parallel branch of a circuit, what is the effect on (a) total resistance, and (b) total current?

1. (a) Increases   (b) decreases
2. (a) Increases   (b) increases
3. (a) Decreases   (b) decreases
4. (a) Decreases   (b) increases

3-54. If a short circuit occurs in a series portion of a circuit, what is the effect on (a) total resistance, and (b) total current?

1. (a) Increases   (b) decreases
2. (a) Increases   (b) increases
3. (a) Decreases   (b) decreases
4. (a) Decreases   (b) increases

3-55. If a short circuit occurs in a parallel branch of a circuit, what is the effect in (a) total resistance, and (b) total current?

1. (a) Increases   (b) decreases
2. (a) Increases   (b) increases
3. (a) Decreases   (b) decreases
4. (a) Decreases   (b) increases

3-56. If one branch of a parallel network shorts, what portion of the circuit current, if any, will flow through the remaining branches?

1. An amount determined by the combined resistance of the remaining branches
2. All
3. One-half
4. None

3-57. Which of the following circuit quantities need NOT be known before designing a voltage divider?

1. The current of the source
2. The voltage of the source
3. The current requirement of the load
4. The voltage requirement of the load

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THE FOLLOWING INFORMATION IS TO
BE USED IN ANSWERING QUESTIONS 3-58
THROUGH 3-60: A VOLTAGE DIVIDER IS
REQUIRED TO SUPPLY A SINGLE LOAD
WITH +150 VOLTS AND 300 MILLIAMPS
OF CURRENT. THE SOURCE VOLTAGE IS
250 VOLTS. (HINT: DRAW THE CIRCUIT.)

3-58. What should be the value of the bleeder
current?

1.   3 A
2.   300 mA
3.   30 mA
4.   3 mA

3-59. What should be the ohmic value of the
bleeder resistor?

1.   50
2.   500
3.   5 k
4.   50 k

3-60. What is the value of total current?

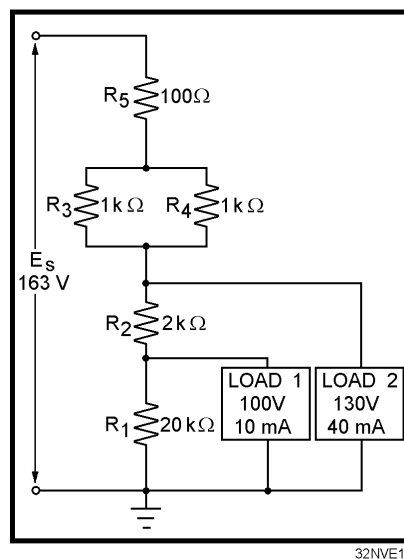1.   303 mA
2.   330 mA
3.   600 mA
4.   3300 mA

Figure 3I.—Voltage divider.

IN ANSWERING QUESTIONS 3-61
THROUGH 3-66, REFER TO FIGURE 3I.

3-61. Why must the value of R_1 be calculated
first?

1.   For convenience
2.   The current through R_2 depends on the
value of R_1
3.   The voltage drop across R_1depends on
the value of load 1
4.   In any circuit, values for resistors
labeled R_1 are calculated first

3-62. How is the current through R_2 calculated?

1.   By adding I_{R1} and the current
requirement of load 1
2.   By adding the current requirements of
load 1 and load 2
3.   By subtracting the current requirement
of load 1 from the current
requirement of load 2
4.   By subtracting the current requirement
of load 2 from the current
requirement of load 1

3-63. How is the voltage drop across R_2 calculated?

1. By adding the voltage requirements of load 1 and load 2
2. By subtracting the voltage drops across R_5 and R_3 from the source voltage
3. By subtracting the voltage requirement of load 1 from the voltage requirement of load 2
4. By subtracting the voltage requirements of load 1 and load 2 from the source voltage

3-64. What is the minimum wattage rating required for R_5?

1. 1 W
2. 2 W
3. 1/2 W
4. 1/4 W

3-65. What is the total power supplied by the source?

1. 3.765 W
2. 7.965 W
3. 8.209 W
4. 8.965 W

3-66. What is the purpose of using the series-parallel network consisting of R_3, R_4, and R_5 in place of a single resistor?

1. It provides the desired resistance with resistor values that are easily obtainable
2. It provides the close tolerance required for the circuit
3. It is more reliable than the use of a single resistor
4. It costs less by using three resistors of lower wattage rating than a single, large power resistor

3-67. A single voltage divider provides both negative and positive voltages from a single source voltage through the use of a

1. ground between two of the dividing resistors
2. ground to the positive terminal of the source
3. ground to the negative terminal of the source
4. ground to the input of all loads requiring a negative voltage

3-68. Which of the following voltages are considered dangerous?

1. Voltages above 115 volts only
2. Voltages above 230 volts only
3. Voltages above 450 volts only
4. All voltages

3-69. If you discover a possible malfunction in an electric circuit, which of the following actions should be taken?

1. Attempt repairs yourself
2. Report the malfunction to a qualified technician
3. Ignore the malfunction unless you were assigned to repair it
4. Secure the circuit immediately by removing power at the nearest switch

3-70. If a person has stopped breathing and there is NO detectable heartbeat, who should perform CPR?

1. Medical personnel only
2. The first person on the scene
3. Emergency Medical Technicians only
4. Trained, qualified personnel only